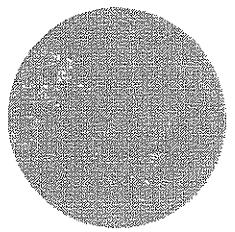


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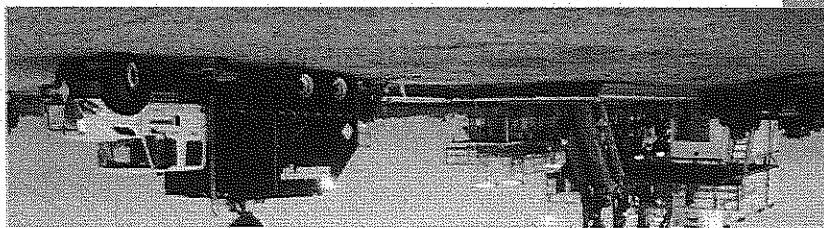
Completion of VW#2



Schlußbericht
Schlußbericht

1205/2012

Drying and Completions of ICCS Project



Schlußbericht
Schlußbericht

Completion design for VW#2



Goals of VW#2

- In zone monitoring of pressure
- Conduit for surveillance logging
- Ability to sample formation fluids if desired

Goals of Completion

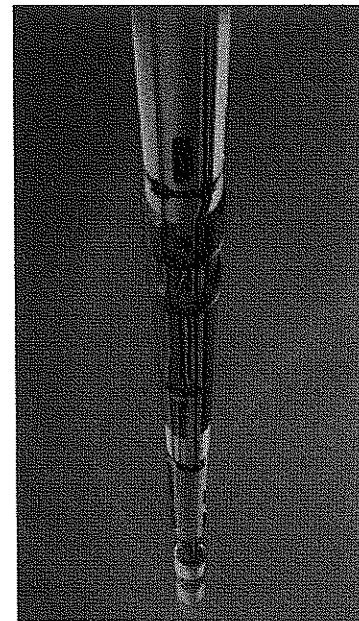
- Deliver completion incident free and within budget
- Install sophisticated completion using best in class technology and techniques
- Maintain wellbore integrity and well control

Completion of VW#2



Completion Procedure (short version)

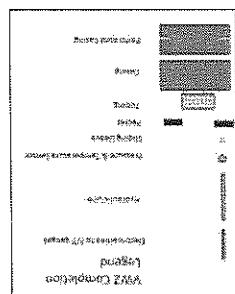
1. Cement evaluation establishing well bore integrity
2. Analyze all available data to pick monitoring levels
3. Pre-commision and test all components
4. Begin field work
5. Isolate and test each zone for all required parameters (pressure, chemistry, flow, etc)
6. Install intelligent completion
7. Test all components



Schimmentiger
Intelligent Zone Compact System

Other 3 sliding sleeves are to provide flow for sampling. These are surface controlled.

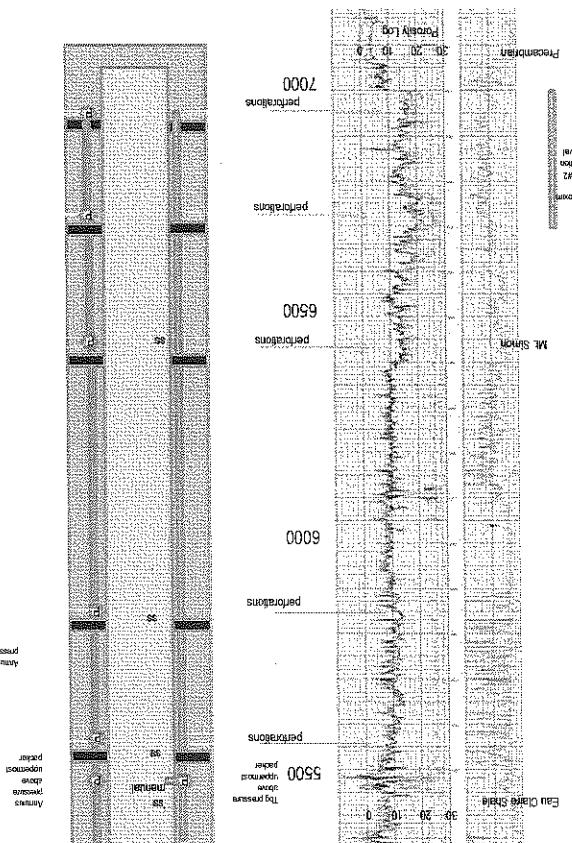
Upper sliding sleeve is to allow circulation of annular fluids if needed.



First fully integrated intelligent flow control system for multi-zone wells – pretested at the manufacturing facility as complete assembly for multi-zone wells – pretested at the manufacturing facility as complete assembly

- design and evaluation software
- packer
- flow control valve
- multidrop module
- dual gauge system
- position sensor
- surface control system
- commissioning and control software

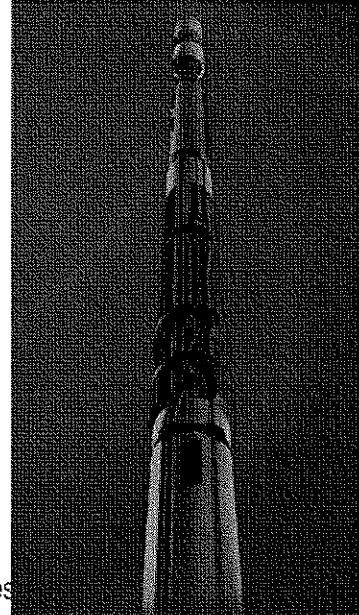
Intelligent Zone Compact® System



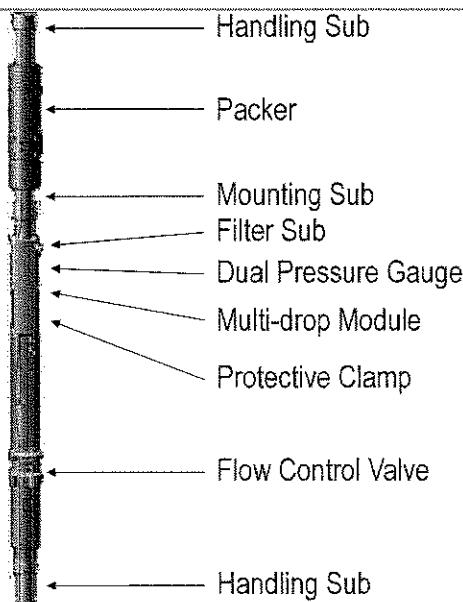
IntelliZone Compact System: Details

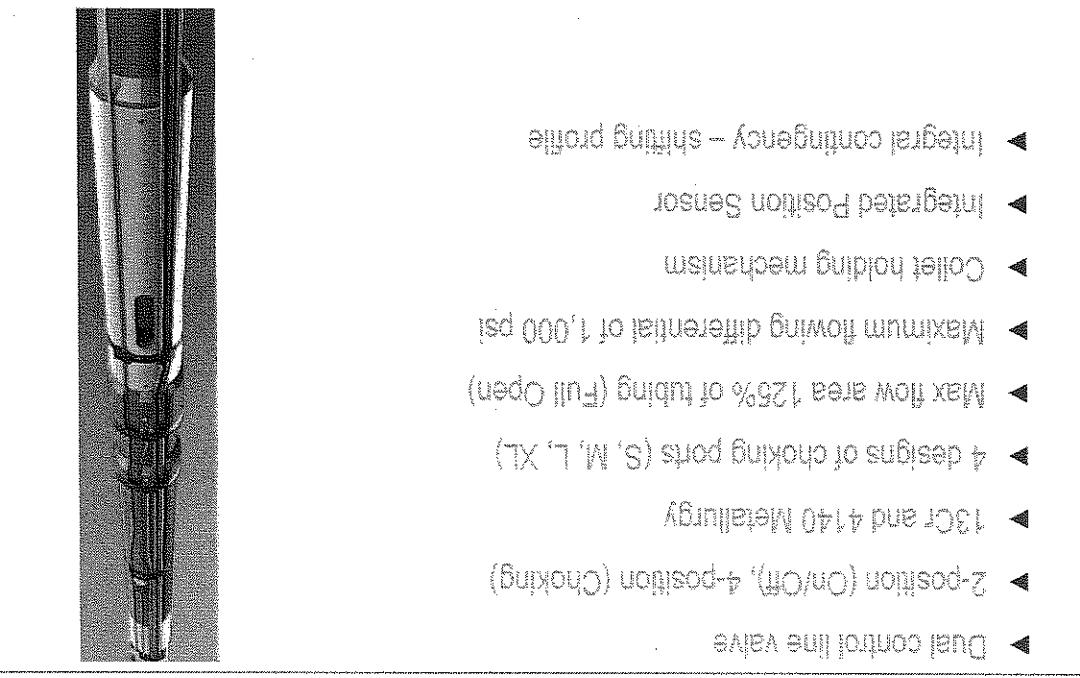
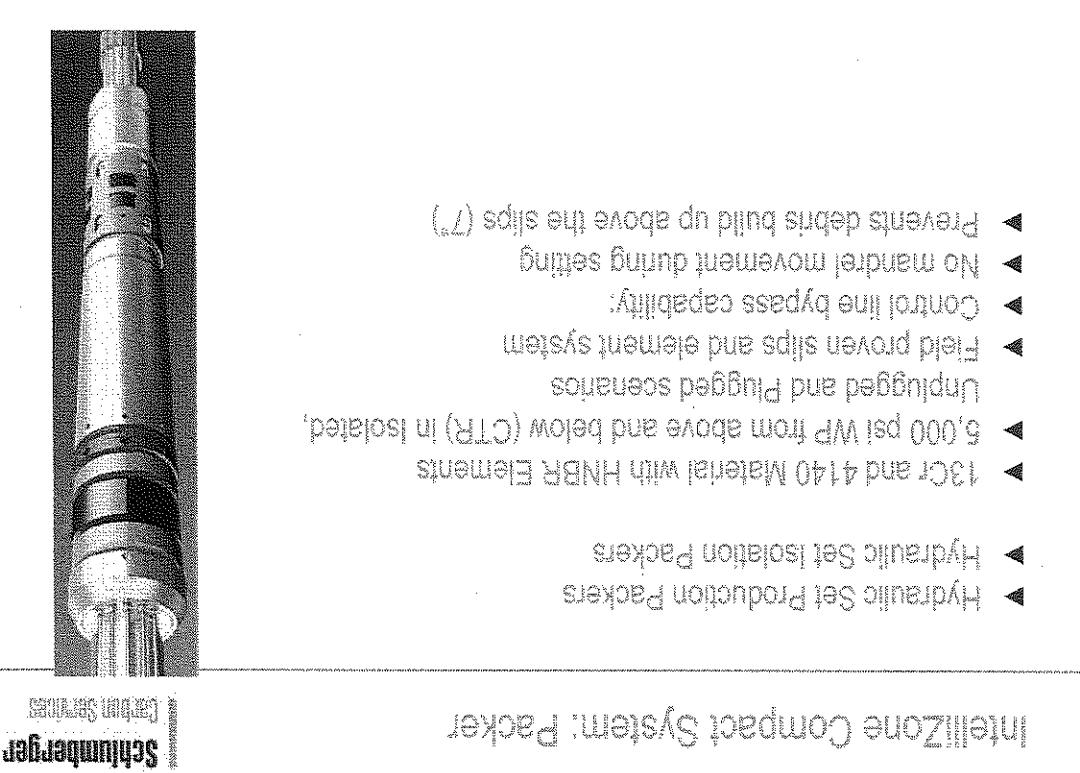


- 5-1/2" csg x 2-7/8" tbg size
- System qualified as one module : 17 – 32 ft long
- Assembled and tested as a system in manufacturing
- 5,000psi working pressure, 250 deg F max
- Material : 13Cr or 4140 options
- Max setting depth 8000ft TVD (with optional Multidrop Module)
- Gauges: Tubing and annulus pressure/temperature with position sensor
- Flow control valves: on/off and variable 4 pos
- Production Packer (top); Hydraulic set; cut-to-release or shear release option flexibility
- Isolation Packer(s): Hydraulic set – straight pull retrieve
- Allows for fluid sampling: purge as VW#1, slickline samples



IntelliZone Compact System: Zone Layout

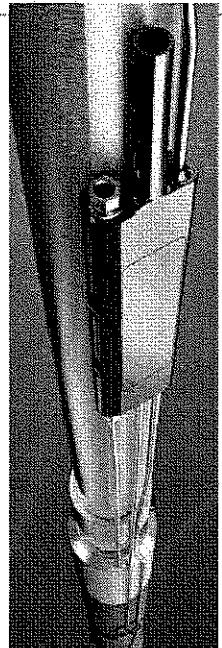




IntelliZone Compact System: Monitoring

Schlumberger
Carbon Services

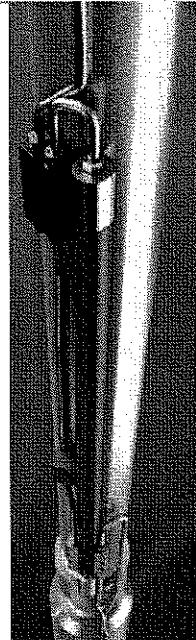
- ▶ Dual pressure gauge for annular and tubing pressure
 - 0-5800psi calibrated
 - 0.2% typ accuracy
 - 1 psi resolution (we will upgrade to higher resolution gauge, M Series Multi Drop NMQG)
- ▶ Dual Temperature sensor built into pressure gauges
 - 2 DegC accuracy
 - 1 DegC resolution
- ▶ Position sensor for flow control valve
 - Absolute position sensor
- ▶ Data and telemetry processing
- ▶ Fully welded except for transducer sealing
- ▶ FSK telemetry with 1 second update rate

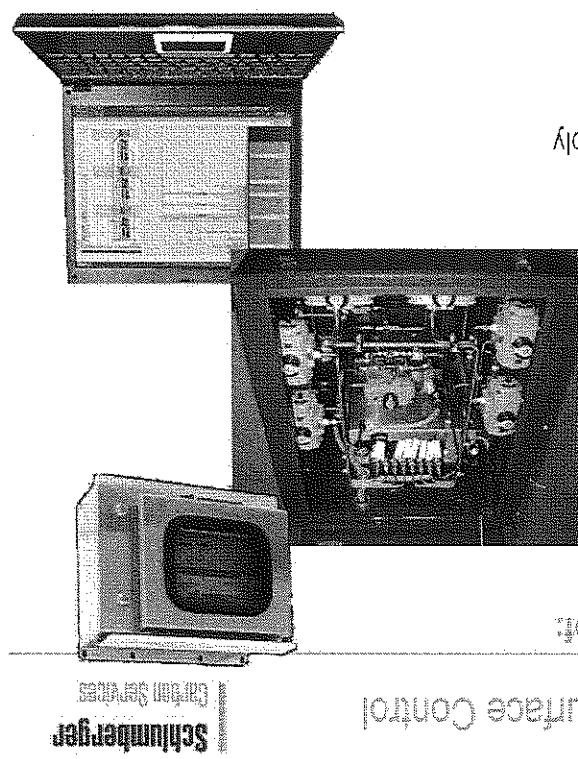


IntelliZone Compact System: Multidrop Module

Schlumberger
Carbon Services

- ▶ Allows more zones to be controlled with less hydraulic lines
- ▶ 3 versions of modules available depending on configurations
 - 2-Pulse (switches every pressure pulse)
 - 4-Pulse (switches every 2nd pressure pulse)
 - 8-Pulse (switches every 4th pressure pulse)
- ▶ Max Control Line Pressure: 10,000 psi
- ▶ Min Control Line Pressure: 7,500 psi
- ▶ Min Reset Pressure: 4,000 psi
- ▶ Hydraulic Fluid Compatibility: Oil and water based
- ▶ Max Setting Depth: Well dependent. 8,000 ft for typical fluid
- ▶ Service Conditions: NACE compliant





Metezone Compact System: Surface Control

- The Control System consists of:
 - 15W 90-260VAC to 24VDC Power Supply
 - Isolated Comm. Card for client interface
 - Isolated Comm. Card for HPU
 - FSK Interface Card
 - UniConn Controller

• The Control System consists of:

- NEMA 3R Enclosure
- Modbus to Modbus

- Solenoid Operated Valve control
- Pressure readings to Modbus

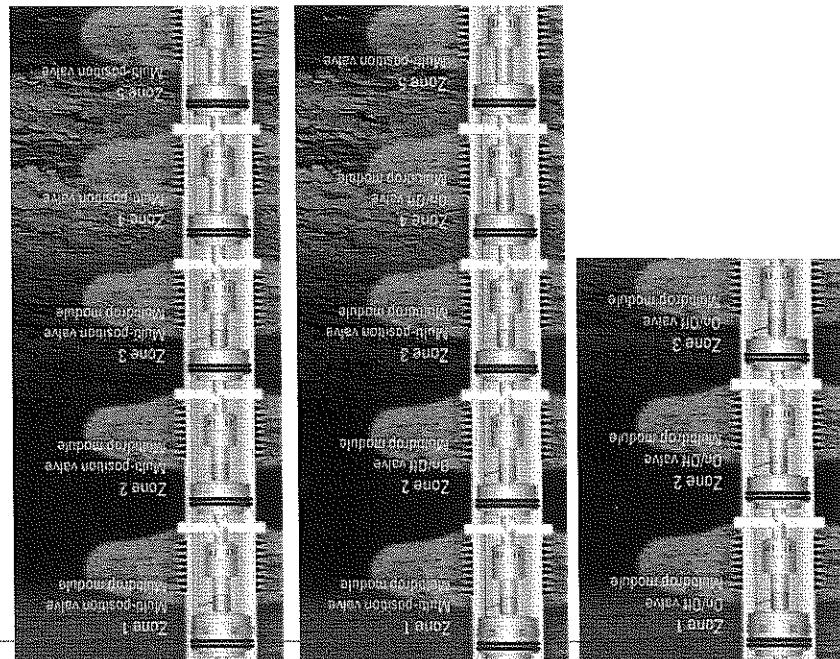
- Solenoid-operated valves (Qty. 8)
- Pressure transmitters (Qty. 5)

- Pneumatically-driven hydraulic pump
- Pressure transmitter (Qty. 5)

- Modbus to Modbus
- NEMA 3R Enclosure

Schlimberger
GmbH & Co. KG

3 zones with 2 or
5 zones with 2 or
single hydraulic
line deployed with a



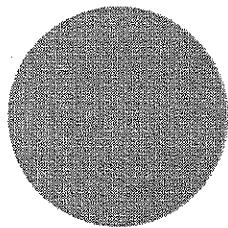
Multidrop Module: Example Configurations

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Summary



- Robust system
- More passive than current Westbay technology
- Flexibility of operation
- Recoverable
- Moderate lead time on system and well head



CCS # 2 Drilling Plans

Planning CCS#2

- Planning is critical to success
- Each step of the process
- Internal and Peer review
- Using best industry and Schlumberger best practices
- Avoiding last minute decisions
- No deviation from standards
- Budgetary control
- Incident free operation

Schlumberger
Quality Services

Drilling CCS#2

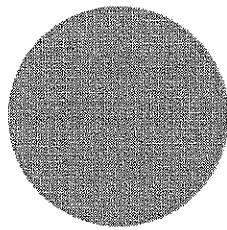
- Thorough review of lessons learned from CCS#1
- Incorporating newer information from recent drilling campaign
- Consolidating into thorough drilling plan
- Well is unique to Illinois Basin
- Beyond standard Basin drilling practices
- Beyond most equipment in Basin

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Being prepared when the permit is issued!!!!

Where are we today and what are we doing?

- Analyzing and review most recent drilling campaign
- Building well plan document
- Document will define rig requirements
- Have sourced or in process of sourcing long lead items
- Site mostly built



Geophysical Monitoring Well # 2

Completion

Geophysical Monitoring Well #2 Completion

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GEOPHYSICAL SERVICES

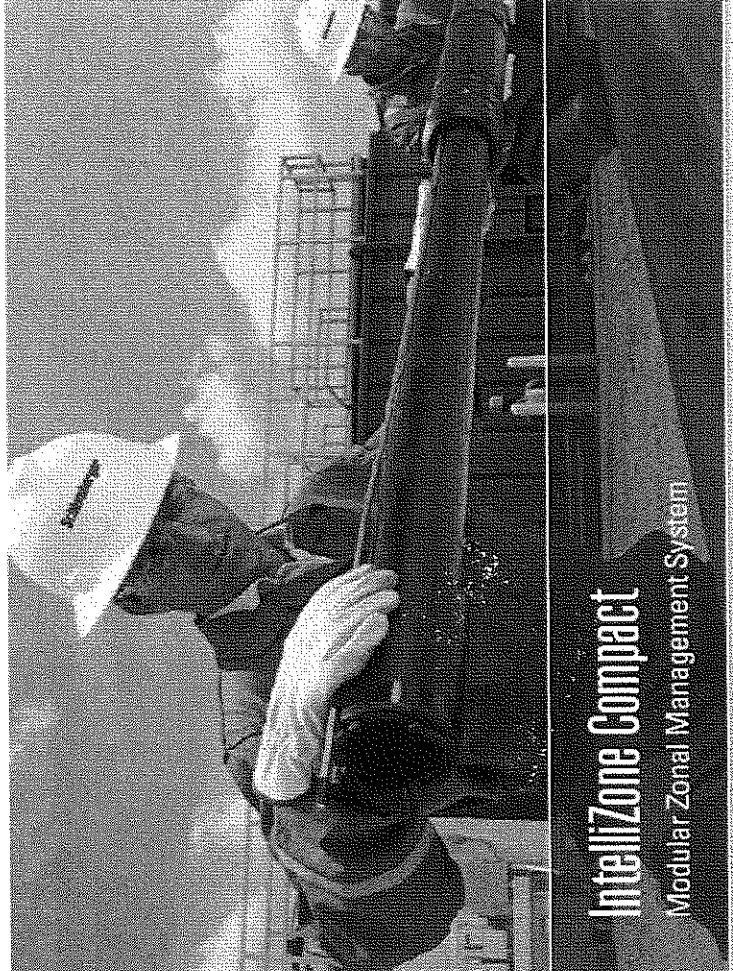
Cement evaluation

Use as geophysical monitor well

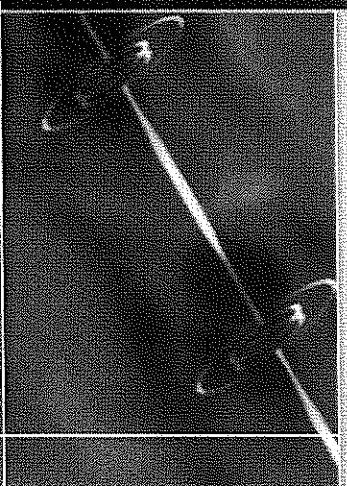
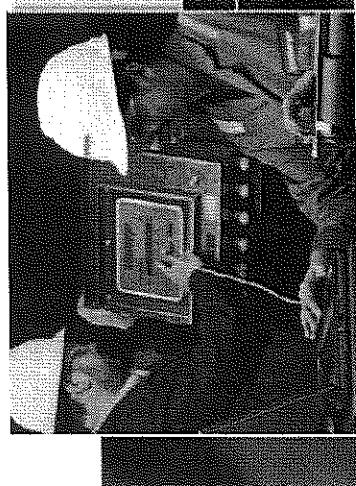
Peforate St. Peter as required for above zone monitor well

Schlumberger

Out of the box. Into the zone.



Advancing conventional
completions



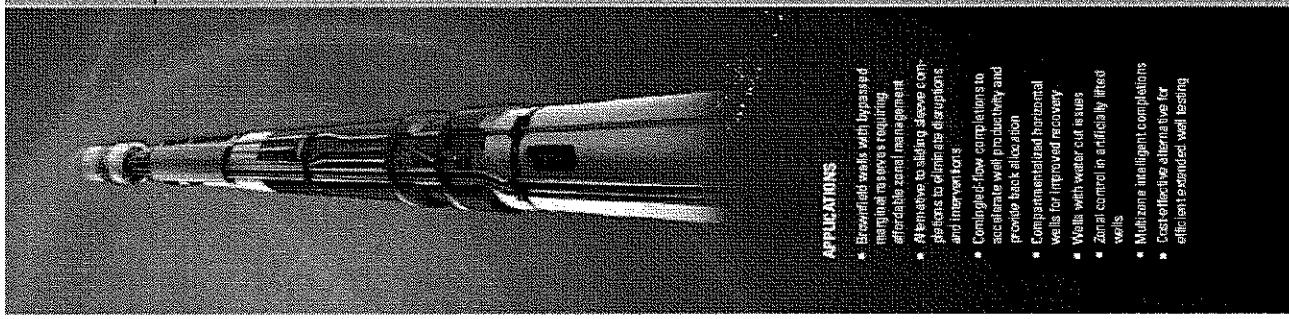
IntelliZone Compact
Modular Zonal Management System

The drive to increase hydrocarbon recovery requires targeting previously unattractive marginal reserves and places stronger demands on a completion's functionality. As a result, completions have become more sophisticated and complex—and wells may a time-consuming and costly to produce. To justify the continued investment in these reservoirs, however, and minimize the risks associated with well completions, the recovery process needs to become more streamlined, efficient, and versatile.

The Schlumberger IntelliZone® Compact modular zonal management system represents a new way of thinking. This first fully integrated unit is designed for multizone wells across a wide range of applications. Compared with traditional intelligent完井 interfaces, the system is easier to design, faster to deploy, simpler to control, and more reliable for the life of the well.

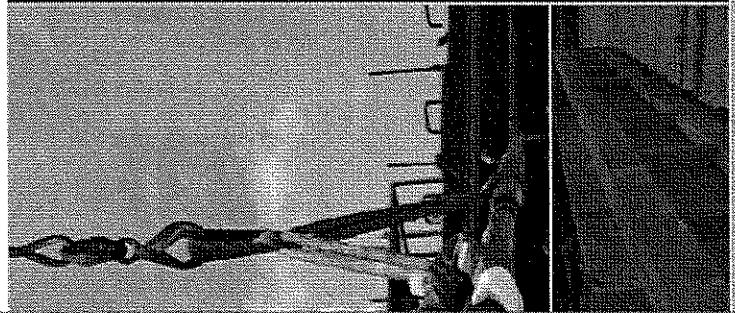
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Seamless zone management



ADVANCING CONVENTIONAL COMPLETIONS

From completion design to deployment and production, the IntelliZone Compact system is engineered to maximize recovery by configuring the best completion options, controlling flow, and draining the reservoir most efficiently and effectively.



Install the system

The IntelliZone Compact system reduces the complexity of completion installation. The entire completion module is delivered to the wellsite ready to install out of the box. By arriving preassembled and pressurized as one complete unit, the system reduces delay and uncertainty during its run. The compact length and integrated assembly make it easier and safer to handle and run in both traditional intelligent completions. The IntelliZone Compact system's integrated design also helps reduce the number of hydraulic lines required without reducing the number of valves the operator can control downhole.

Define the zones

By inputting wellbore data at the design stage, operators can rapidly explore different completion options in detail. The system provides the versatility to fine tune the design configuration—from selecting different choke sizes to adjusting flow control valve positions—and to understand the production implications of each change. As a result, this system represents a highly efficient, low-risk workflow for creating the optimal completion solution.

Produce and control

The IntelliZone Compact system ensures that production start-up is smooth and streamlined. A user-friendly interface makes valve operation a simple two-click procedure, directing pressure sequences to the appropriate control valves. After the system is deployed, key functions allow the operator to make informed decisions on a daily basis: real-time production monitoring with pressure and temperature gauges and absolute position sensing of the flow control valves. With these enhanced capabilities, the IntelliZone Compact system offers a highly reliable way to control zones, manage flow, and drain a reservoir.

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flowing surface-controlled advanced flow management systems installed in a well can help operators increase production and reservoir recovery from both new and mature wells.

The IntelliZone Compact system provides this capability for conventional完井 configurations up to 200 bbl/d [121 bbl/d and 5,600 psi [34.4 MPa]. However, it accommodates well environments with higher temperatures or pressures, can be provided by Schlumberger's traditional intelligent完井 completion.

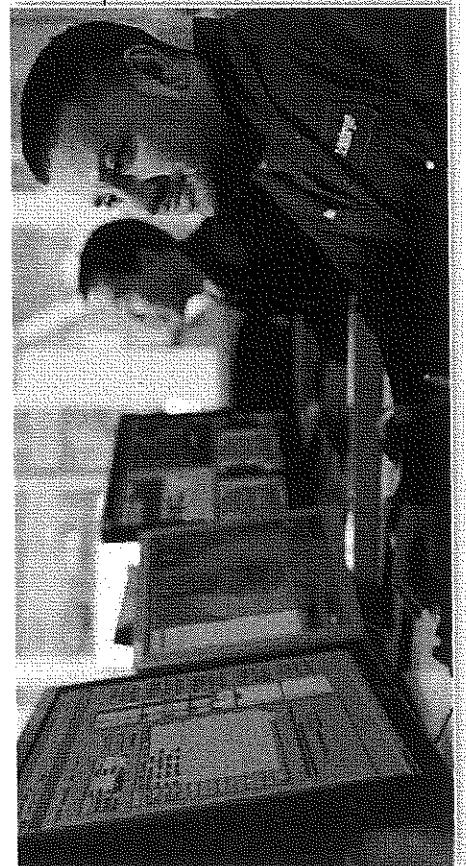
The IntelliZone Compact system can help diagnose production problems, mitigate costly disruptions, and optimize well performance. This functionality is provided by both the surface and the downhole components. The automatic surface control system allows the well to be diagnosed in real time. The system's remote communication capabilities, through either a local SCADA or a remote computer, facilitate diagnostics, well testing, and production optimization.

Straightforward design
The integral components of the IntelliZone Compact system are designed as one compact assembly. As part of a 3D modeling, the assembly is half the length of traditional intelligent完井 completions, making it easier to handle and install. The complete system is based as a single unit in manufacturing before being shipped to the wellsite. With the components, connections, and controls housed in a single package, it is reliable and custom fit to unique requirements of a particular reservoir or well. The IntelliZone Compact system is more reliable than traditional intelligent completions.

Simple control
With control logic programmed into the surface control system, valve operation is a simple two-click computer command. The IntelliZone power unit allows multiple zones to be managed simultaneously and in real time, greatly increasing well control and minimizing interventions and risks.

Quick delivery
Components are manufactured, assembled, tested, and packed by Schlumberger. When an order is received, the system can be immediately packed and shipped to the customer.

The first fully integrated flow control system for multizone wells.



Advanced engineering, compact design

The IntelliZone Compact system brings together a one contact hub—an advanced design and production modeling engine, a fully integrated corruption module, and a powerful, user-friendly, remote operating system.

The modular components are on general, preassembled, and prewired to work together as a single unit. For operators, the IntelliZone Compact system provides a fast, cost-effective, necessarily reliable solution that is simple to control.

WallBuilder software. The versatile WallBuilder™ modeling software for construction systems uses web data to simulate production scenarios, company concept designs, explore their implications for production, and ultimately derive the optimal configuration solution. The flow modeling software, seen in the integrated PIRESTAR™ System's factory software, fine-tunes the completion design by modeling multiple flow paths from the reservoir to the wellhead and analyzing flooding and surface facility performance.

Flow control valves. This system's flow control valves—either on/off or multi-position—have a built-in tool for holding mechanisms that reduces risk during operation by ensuring that the valve position does not unintentionally change. A special probe device keeps the valve seals from being exposed to flow during actuation and operation, thereby preventing damage from erosion. Wellbore fluids at differential pressures. These valves also have an integral shifting profile for contingency operations.

Hydraulic start-up profiles. Multi-step mode allows more flow control valves to be actuated on fewer hydro auto control lines than is traditional. In wellbore completions, these hydraulically operated modules reduce installation complexity by allowing up to three zones to be controlled on a single line. Pressure set points are user friendly. Pressure and temperature gauges offer measurements from both the annulus and the tubing in every zone. Up to three zones can be monitored on a manometer/pressure gauge, offering one integrated per line.

Visualizing control software. With two-click valve commands, the visualization control software enables operators to easily manage well production with quick control of the downhole valves. It also analyzes them to see a zone

Operator in India Saves USD 1 Million Within 2 Months

An operator offshore India planned to complete a multizone well with either shifting sleeves or surface-controlled flow control equipment.

For this multizone completion design, however, the shifting sleeves would have required intervention to shift, and the number of surface control lines needed for the flow control equipment outnumbered the available penetrations on the existing interventions and the existing equipment. This made the shifting sleeves and its final flow control completions impossible.

Stimulate well!

To bring the well online, the zones required design. With the shifting sleeves design, the operator would have needed to adjust all the zones simultaneously or to deploy collaring tools to manipulate the individual sleeves in each zone. Deploying collared tubing would have required 3 weeks to plan, implement and to costly to procure.

Applying the acid treatment to all the zones at once would have severely treated only the most permeable zone, leaving the other two zones untreated. On the other hand, selecting one zone at a time would ensure that every zone was properly treated.

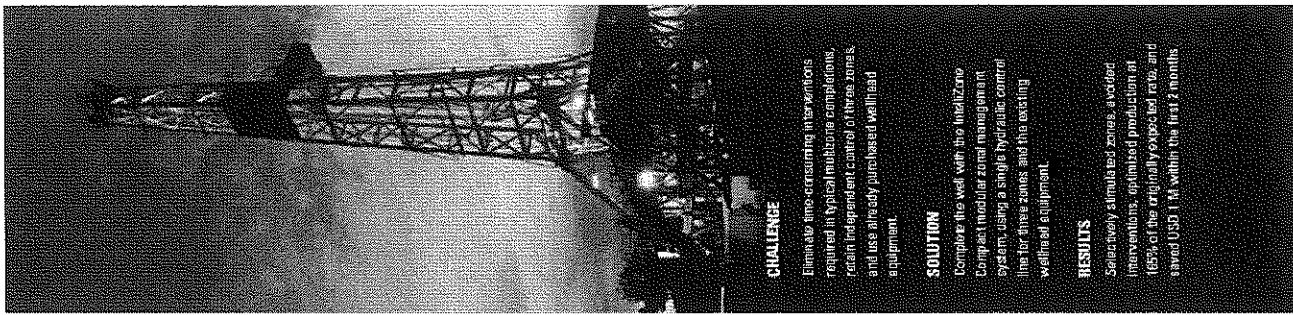
Install IntelliZone Compact system

To meet the original design criteria of using the existing wellhead equipment, Schlumberger recommended its IntelliZone Compact master zone management system. This system integrates a flow control valve, an optional pressure and temperature monitoring system with valve position reporting, and a central computer system that eliminates the need for the rig and control building intervention, saving a total of 3 weeks. As a result, the operator optimized production at a 105% of the originally expected rate and saved USD 1 million within the first 2 months.

RESULTS

Complete multizone stimulation avoided interventions, optimized production of 105% of the originally expected rate, and saved USD 1 M within the first 2 months.

The multizone module allowed three zones to be selectively controlled on a single hydraulic line.



After this initial multidrop module, and a packer. The operator's multidrop module allows more flow control valves to be actuated on fewer hydro auto control lines than is traditional. Thus with traditional flow control completions it is not to be controlled from the surface in real time without intervention.

The Schlumberger IntelliZone Compact system were displayed, each with one case-hardened packer and two swivels/valve assembly. By using these systems, the operator was able to selectively control all three zones with a single hydraulic line. Controlling pressure applied at the surface actuators at a proportional valve was necessary to perform the acid treatment selectively. Treating the specific zones individually allowed for optimal stimulation—without the need for a rig or treated tubing intervention.

Challenge

Controlling pressure applied at the surface actuators at a proportional valve was necessary to perform the acid treatment selectively. Treating the specific zones individually allowed for optimal stimulation—without the need for a rig or treated tubing intervention.

Solution

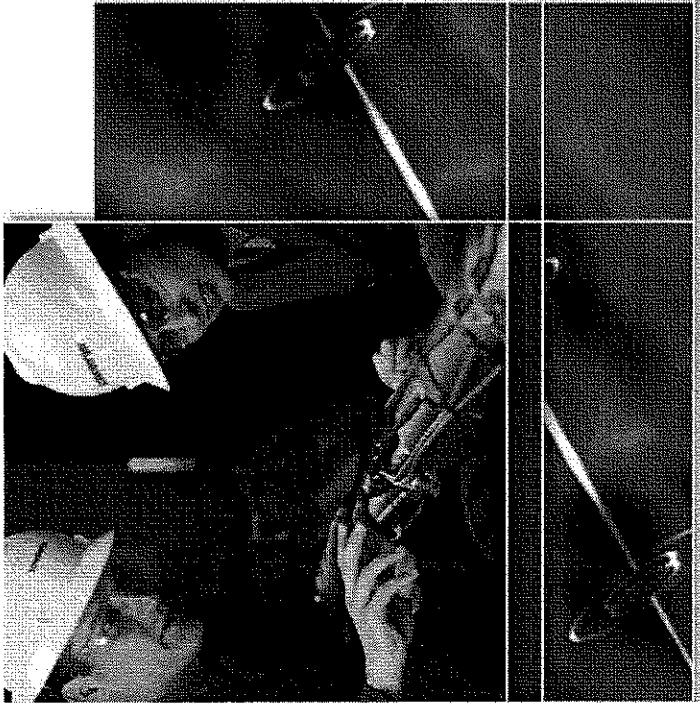
Complete the well with the IntelliZone Compact module and a central monitoring system, using a single hydraulic control line for three zones, and then treating wells set at a stimulation.

IntelliZone Compact

**Maximize recovery effectively,
simply, and reliably.**

By reducing completed lead times, accelerating commissioning, and minimizing disruptions and interventions, the advanced IntelliZone Compact system is the most efficient way to control zones and manage production across a wide range of applications.

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As reservoirs and applications
become more complex —
and efficiency and reliability more
critical than ever — Schlumberger
is committed to leading the industry
in integrity, systems, safety,
approaches to complete service
and technology. One such approach
to total management is the need for
IntelliZone® Control System. It offers
a reliable, redundant form
of control of reservoirs and wells with
quiet, and safe, automated solutions.

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